>RMG ENTERPRISES PRESENTS<

SEKTOR 2068

VERSION 1.5

Written by

Mowgli Assor

SEKTOR 2068 COMMAND SUMMARY

CAPS (1-8)	SWITCH BETWEEN SCREENS (Depends on density)
CAPS - 9	TOGGLE TEXT MODE
CAPS - 2	TOGGLE CAPS LOCK (In Text Mode)
CAPS - 0	BACKSPACE CHARACTER (In Text Mode)

```
   I
 J + K      CURSOR KEYS
   M
```

G	COPY SCREEN (T/S 2040)	T	TRANSLATE IBM CLUSTERS
H	SHOW HELP SCREENS	U	COMPARE BLOCK
L	CHANGE LOGGED DRIVE	V	ERASE BLOCK
N	GET NEW DISC PARAMETERS	W	WRITE SECTOR TO DISC
O	CATALOG/ERASE FILES	X	EXAMINE SECTOR DATA
P	LIST TO PRINTER	Y	COPY BLOCK
Q	QUIT TO BASIC	<SPACE>	SKIP TO NEXT BYTE
R	READ SECTOR FROM DISC	+	READ NEXT SECTOR
S	SWITCH BUFFERS	-	READ PREVIOUS SECTOR

Use 'GOTO START' in BASIC to enter the program without reLOADing the program. Screens 3 & 4 are only used in double & quad density, and screens 5 - 8 are only used in quad density.

NOTE: If, during the HEX input, you find that you have made an error after the first number is entered, you can abort the input and start the number pver by simply pressing "SPACE". That deletes the first number and allows you to start it over.

INTRODUCTION TO SEKTOR

Welcome to SEKTOR, a sector editor for the T/S 2068 & AERCO FD-68 disc interface. SEKTOR will LOAD automatically, but manually you may use either 'CAT "SEKTOR.BAS",' or 'CAT "BOOT.BAS",' to LOAD it. SEKTOR will read and write most AERCO, MS-DOS, and RP/M discs.

Since the AERCO Z-DOS exits to BASIC upon any error, this program will also do so. There are no error trapping routines in this program. If a non-fatal error occurs, type 'GOTO START' and <ENTER> to return to the program without reLOADing the code from disc. If the error persists, please notify me when and where the error occurs so that I can correct it.

The idea of a sector editor is not new, since there are numerous ones around for the Apple II and IBM PC lines. For programmers, they are considered an extremely useful tool when working at all with a disk drive. The origins of SEKTOR basically come from 3 programs on the market today: COPY II+ and ZAP for the Apple II, and DISC MECHANIC for the IBM PC.

A note on numbers: SEKTOR will display numbers in HEX on the main screen, so a familiarity with HEX is suggested. Whenever you are asked for an INPUT, it should be entered in DECIMAL. In examine mode, all numbers are given in DECIMAL.

If you have any questions or comments, please write to me at :

MOWGLI ASSOR
1707 Tremont Road
Columbus, OH 43212

SEKTOR 2068 COMMAND DESCRIPTIONS

CAPS (1-8) : SWITCH SCREENS

These commands allow you to switch between the 8 screens of data, each of which holds 128 bytes. There are 2 screens for single density, 4 for double density (and IBM format), and 8 for quad density (and RP/M format).

CAPS - 9 : TOGGLE TEXT MODE

When text mode is on, the word 'TEXT' will appear in the upper right hand part of the screen. This means that with the exception of CAPS - 2, CAPS - 9, and CAPS - Ø, any PRINTABLE character which you type will be converted to hex and entered at the cursor position. CAPS - 2 will toggle the CAPS LOCK, and when CAPS are on the word 'CAPS' will appear besides the word 'TEXT'. CAPS - Ø will move the cursor back 1 charactor. Use CAPS - 9 to enter & exit text mode.

<SPACE> : SKIP TO NEXT BYTE

Hitting <SPACE> will move the cursor position to the next byte. When the lower right corner of the screen is exceeded, the cursor will return to the upper left corner. Be careful to switch screens before overtyping your previous work.

I J K M : CURSOR CONTROLS

Instead of the normal arrow keys, the keys I J K & M are used as the cursor keys. They are conveniently located and are also more efficient.

G : COPY SCREEN TO T/S 2040

This command will copy the current screen to the 2040 printer. It is also for those that don't have an AERCO (or compatible) printer I/F, in place of the P command (see below). Also see Appendix D.

H : HELP SCREENS

If you forget which commands are which, hit H and a pair of help screens will pop up. Hit 1 or 2 to see each of the help screens, or 0 to return to editting the sector data.

L : CHANGE LOGGED DRIVE

You will be shown the current drive and asked which drive you wish to log in. Hit <SPACE> to abort the change, or (A-D) for the new drive. After choosing a new drive, you will be asked if you want to choose new parameters for that drive (see the 'N' command).

N : GET NEW DISC PARAMETERS

This command will allow you to switch between AERCO, RP/M, and IBM disc formats. If you switch to an AERCO format, you will be asked to enter the parameters individually. Hit <SPACE> to abort the change. If you switch to IBM mode, you will have to choose between MS-DOS Version 1.1 and Version 2. PLEASE: remember to do this every time you switch to a different type of disc or drive.

O : CATALOG & ERASE FILES (AERCO ONLY)

You can choose to either (C)ATALOG the disc or (E)RASE FILES, or use <SPACE> to abort. When erasing files, hit <ENTER> when asked for the filename, and you will return to the sector data.

P : LIST TO PRINTER

This command will print either 16, 32, or 64 lines of sector data, depending on what the current density is. Each row contains 16 HEX values and their corresponding ASCII characters, if printable, or a '.' if not. Also see APPENDIX D.

Q : QUIT TO BASIC

This function SHOULD be used when you wish to leave the program. You may later type 'GOTO START' to return to the program without reLOADing it. 'GOTO START' should also be used to return if an error occurs.

R : READ SECTOR FROM DISC
W : WRITE SECTOR TO DISC

You will be asked for the track, sector, and side which you wish to read/write. Hit <SPACE> at any time to abort the read/write. The sector will be read off/written to the currently logged drive.

S : SWITCH BUFFERS

Use this command to switch between the 2 internal buffers incorporated into SEKTOR. The current buffer number will show up in the lower right part of the screen.

T : TRANSLATE CLUSTER INFO

This function will help those of you with IBM PC computers. You will be first asked which version of MS-DOS you are using. You will then see a little menu at the bottom of the screen. Your choices are: 1) TRANSLATE A CLUSTER NUMBER, 2) TRANSLATE TRACK & SECTOR INFORMATION, or 3) hit <SPACE> to EXIT to the main screen.

U : COMPARE A BLOCK

After choosing the block that you wish to compare, the 2 buffers will be compared only in that block. All bytes which ARE NOT the same will be listed. When the screen is full, you can either (C)OPY the screen, (Q)UIT to the main screen, or hit <ENTER> to continue comparing the buffers.

V : ERASE A BLOCK

After choosing the block that you wish to erase, the computer will fill that block with 0s. To interrupt the process, hit the <BREAK> key and then type 'GOTO START'.

X : EXAMINE SECTOR DATA

This command will allow you to look at the sector data in an expanded form. All characters & Sinclair tokens will be printed, and you can hit <SPACE> to change a value. Use 'I' to move up, 'M' to move down, 'B' to start at a new byte number, and 'Q' to quit to the main screen.

Y : COPY A BLOCK

This command will ask you to define a block, then copy that block to a new starting byte. If you want to interrupt the process, you have to hit <BREAK> and type 'GOTO START' to return to the main screen.

+ : READ NEXT SECTOR
- : READ PREVIOUS SECTOR

The commands '+' and '-' will read the next or previous sector. These commands depend on the disc parameters, so make sure that the correct disc parameters are active before using these commands. If you don't, a large amount of errors could occur from from trying to read non-existant tracks/sectors.

APPENDIX A : THE ANATOMY OF AN AERCO DISC

On an AERCO (T)IMEX format disc, the files are allocated in tracks of 5120 bytes (double density) at one time. Track 0 is the directory track, and sectors 2 & 3 contain the actual disc directory along with the track lists for each file. Sector 1 contains the disc name & ID.

SECTOR 1

```
18 0E 54 AB EC 00 53 45 4B 54 4F 52 00 00 00 00 ..T...SEKTOR...
C3 39 35 00 00 00 00 00 00 00 00 00 00 00 00 00 .94............
```

Track 00, Sector 01, Side 0 - The Disc Header

This sector contains the disc type, ID number (set randomly), and the disc name. The letter T (byte 3) signifies that this is a Timex formatted disc. Following the T are the 3 bytes for the disc ID. In this case they are AB, EC, and 00, which gives an ID of AB00EC, or 171(AB) 236(EC) in decimal. The ID may be changed, but changing the 'T' will change the disc format & cause problems.

Immediately following the ID bytes is the disc name, in this case SEKTOR. This can also be changed without injuring the disc, but it is limited to 10 characters.

The bytes 18 0E are a relative jump which skips the disc name & ID, and moves the pointer to the bytes C3 39 35, which are a jump to the location 3539h. I haven't found out what happens when you change them, but I'd suggest tacking the C3 39 35 on to the end of whatever code you put there.

SECTOR 2

```
E0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................
00 53 45 4B 54 4F 52 00 00 00 00 3C 13 0A 00 4D .SEKTOR....<...M
12 01 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................
03 53 45 4B 54 4F 52 00 00 00 00 26 08 DA F7 01 .SEKTOR....&....
03 02 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................
```

Track 00, Sector 02, Side 0 - The Disc Directory

Sector 2 is the first of 2 directory sectors. The 1st 32 bytes of sector 2 are dedicated to the amount of used space on the disc. On the Remex (DS, DD, 40 track) disc the 1st 5 bytes are used, 11 are skipped (for side 0), then another 5 bytes are used and 11 are skipped (for side 1).

Each individual HEX digit keeps track of 4 tracks, so for each F, 20K of disc space has been allocated.

To decipher each HEX digit, we have to look at its binary representation. The 1st byte above is E0, which is 1110 in binary, so we see that 3 tracks have been used, and that these are tracks 0, 1, & 2. Track 3 is empty because of the last bit being 0. The numbers 7 (0111), E (1110), & D (1101) all use up the same amount of space, but different tracks have been allocated. For B, tracks 0, 2, & 3 have been used, but track 1 is empty. You have to be careful, because the firmware looks for the first unallocated track and uses it and this could erase some necessary data if you alter the allocation table.

After the first 32 bytes come the file headers & track lists. out of the 32 bytes allotted each file, 17 bytes are reserved for the file header, which is laid out like a tape header.

# OF BYTES	FUNCTION
1	FILE TYPE (see below)
10	FILENAME
2	LENGTH OF FILE
2	STARTING LINE NUMBER (if BASIC) STARTING ADDRESS (if BINARY)
2	PROGRAM LENGTH (if BASIC)

The following are valid file types:

0	BAS	1	DAT	2	CHR	3	BIN
4	SCR	5	ARO	6	LRO	7	BUT
8	VAR						

After the file header comes the track allocation list. Side 0 tracks begin with 00h, while side 1 tracks begin with 80h and continue from there (7th bit set). This continues for the next 15 bytes, bringing the total number of bytes used to 32.

One last bit of information: When a file is SAVEd (MOVEd) in Z-DOS, the disc hardware actually writes 2 headers. One is put in the directory above, and another is put in the first sector of the first track in the allocation list for that file. If you need to UNERASE a file, you can just look at the first sector of each track until you find a header with that filename, and then copy it back into an appropriate part of the header. The only problem is that the track allocation list is not included in the header, so that if it uses more than 1 track, you will have to reconstruct the track list yourself. If you do this, don't forget to de-allocate the space in the first 32 bytes of sector 2.

APPENDIX B : THE ANATOMY OF AN IBM DISC

In DOS 1.1, track Ø sectors 4-7 contain the disc directory. For double sided discs, the directory also includes track Ø sector 8 and side 1, track Ø sectors 1 & 2. In DOS 2., track Ø sectors 6-9 and side 1, track Ø sectors 1-3 (for double sided discs) contain its directory.

There are 3 big differences between AERCO and MS-DOS disc formats:

1) The AERCO disc has (with the Remex drive) 4Ø tracks of 1Ø sectors each, with the number of bytes/sector depending on the density. The IBM format (non-protected) has 42 tracks of 9 sectors each, with 512 bytes/sector (double density).

2) While the AERCO disc allocates space in tracks, the IBM format conserves space by allocating it in sectors. This means that the IBM format must have an elaborate track/sector allocation scheme. Enter the cluster number, which, when converted will give you the starting track, side, & sector of the file. The cluster scheme is too complicated to discuss here, but the T command (see Command Descriptions) will translate clusters for you using a BASIC algorithm.

3) Since the IBM PC was billed as a business system, it keeps track of the data & time of last update of each file. This function also takes up some space in the file header.

```
49 42 4D 42 49 4F 20 20 43 4F 4D 27 00 00 00 00 IBMBIO  COM'...
00 00 00 00 00 00 00 60 54 07 02 00 80 12 00 00 ........'T......
49 42 4D 44 4F 53 20 20 43 4F 4D 27 00 00 00 00 IBMDOS  COM'...
00 00 00 00 00 00 00 60 54 07 07 00 80 42 00 00 ........'T...B..
```

Track ØØ, Sector Ø6, Side Ø - Start Of The Directory

# OF BYTES	FUNCTION
8	FILENAME
3	FILE EXTENSION
1	HIDDEN STATUS BYTE
1Ø	RESERVES BYTES
2	TIME OF LAST FILE UPDATE
2	DATE OF LAST FILE UPDATE
2	STARTING CLUSTER
4	FILE SIZE (Length)

For the hidden status byte, the following bits are significant. Those labeled (DOS 2.) are only used in DOS 2. and higher.

Bit	0	READ ONLY FILE (DOS 2.)
	1	HIDDEN FILE FLAG
	2	SYSTEM FILE FLAG
	3	VOLUME LABEL (DOS 2.)
	4	SUB-DIRECTORY ENTRY (DOS 2.)
	5	FILE CLODED FLAG (DOS 2.)

Of the 16 bits in the 2 time bytes, the first 5 bits are the hour, the next 6 are the minutes, and the last 4 are the half-seconds (multiply by 2 to get the seconds). Take each group of bits as a binary number and convert them to DECIMAL.

Of the 16 bits in the 2 data bytes, the first 7 bits contain the year minus 1980 (add 1980 to it), the next 4 contain the month, and the last 5 contain the day.

The file size is given with the least significant byte first, so you have to read it backwards in HEX to convert it properly. (For example, 80 42 00 00 above becomes 00 00 42 80 in HEX, or 17024 in DECIMAL).

The cluster numbers are just a way of transforming a track number and sector number into 1 large number. In the directory sector, each cluster number points to the beginning track and sector of the file in question. If the second HEX byte of the cluster number is 01, add 256 to the first byte to get the correct cluster number.

A note on the IBM discs: Although they have 42 tracks, a 40 track drive will only read 40 tracks. Therefore, you are not allowed to (you can't anyway) edit any track beyond 39 in the IBM format. IBM also uses mostly double density discs. This may cause problems for some of you.

APPENDIX C : THE ANATOMY OF AN RP/M DISC

Although there are quite a few things that you can modify in the directory of an RP/M disc, I would advise that before you begin changing the allocation part of the directory, you should consult a book on the subject.

The stock (original) RP/M is very straightforward. Although they haven't changed the RP/M that much, the Morrow format discs are different because of the fact that they have a skew factor, which means that sectors are NOT written in sequential order. Instead, a 'skew factor' is introduced, which makes the hardware skip so many sectors. This could lead to a file being written on sectors 1, 6, 11, 16, etc., instead of on sectors 1, 2, 3, etc. In this case you should definitely consult a text.

In RP/M, as in Z-DOS, each directory entry (or File Control Block, as it's called in RP/M) takes up 32 bytes. In RP/M, however, the 'header' only takes up 16 bytes instead of 17. The last 16 bytes contain, instead of a track allocation list, a block allocation list. In RP/M a block consists of 8 sectors, which equal 1024 bytes (1K) in single density or 2048 bytes (2K) in double density. All files are allocated at least 1 block, no matter how small they are.

The system is contained on tracks 0 and 1. Track 2, sectors 1 through 4 contain the directory, which has a maximum of 128 directory entries.

```
00 43 41 54 41 4C 4F 47 20 44 4F 43 00 00 00 0A .CATALOG DOC....
02 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................
00 5A 38 45 20 20 20 20 20 44 51 43 01 00 00 80 .Z8E     DQC....
08 09 0A 0B 0C 0D 0E 0F 10 11 12 13 14 15 16 17 ................
00 5A 38 45 20 20 20 20 20 44 51 43 03 00 00 80 .Z8E     DQC....
18 19 1A 1B 1C 1D 1E 1F 20 21 22 23 24 25 26 27 ........ !"#$%&'
00 5A 38 45 20 20 20 20 20 44 51 43 05 00 00 55 .Z8E     DQC....
28 29 2A 2B 2C 2D 2E 2F 30 31 32 33 34 35 00 00 ()*+,-./012345..
```

Track 2, Sector 1 - The Beginning of the FCB

# OF BYTES	FUNCTION
1	USER NUMBER, OR E5
8	FILENAME
3	FILE EXTENSION
1	EXTENT NUMBER
2	NOT USED
1	NUMBER OF RECORDS
16	BLOCK ALLOCATION LIST

The first byte serves a double function. If the number is in the range Ø to 15, the file is earmarked for that user area. If the number is E5h, the file has been ERASEd. This makes it very easy to port files between user areas, or to ERASE and unERASE files.

The next 11 bytes are the filename and extension, which are self-explanatory. Thereafter comes the extent number. For very large files which are greater than 16,384 bytes, they will be assigned 1 or more extents, and also 1 or more directory entries. In the above example, the file Z8E.DØC is very large, so it occupies 3 directory entries and multiple extents. Since in the above example we are using a double density disc drive, each directory entry takes up a total of 2 extents, instead of 1 with single density. That is why the extent numbers for Z8E.DØC go 1, 3, 5 instead of 1, 2, 3.

After the 2 bytes which are not used, comes the record counter. This is the total number of records attributed to each directory entry. Notice above that the first 2 directory entries for Z8E.DØC have a record count of 8Øh (128). This is the maximum possible under each directory entry. If a file has more than 128 records of 128 bytes each (16,384), then the extent number comes into effect, and the file will have more than 1 directory entry.

APPENDIX D : BACKUPS & MODIFICATIONS

There are a few modifications you can make to this program, if you wish. First, however, you should ALWAYS make a backup. Also, you should NEVER remove the write-protect tab from the master disc. To make a backup, do the following:

1) Insert the ORIGINAL disc in the current drive
2) Exit the program and type 'GOTO BACKUP'
3) After the screen & message appear, insert the DESTINATION disc in the current drive (It must have already been formatted)

The program will return you to the main screen after the copy is complete. If an error occurs, make sure that the disc has already been formatted, and that there is still enough room on the disc (SEKTOR uses 35K of disc space). Then repeat the above procedures, and if the error persists, try another disc.

For those of you with 80 column printers, you can ignore this. SEKTOR comes set up for printing to an AERCO (or compatible) I/F. For those of you who wish to use the T/S 2040 instead, you need to modify LINE 11. You will see something like:

```
11 LET TS24=Y:CAT "SEKTOR.SCR",
```

Change the Y in that line to Z, so that it now reads:

```
11 LET TS24=Z:CAT "SEKTOR.SCR",
```

This will enable the 'G' command. All screen copies will now go to the T/S 2040.

For those of you who wish to save 10K by removing the title screen, again exit to BASIC and edit line 11. In line 11 (see above paragraph) you will see the command CAT "SEKTOR.SCR",. Delete it, and you will no longer need to copy the screen to disc as well. You will however only be able to make further backups from an unmodified copy.

Finally, you can change the default number of tracks for your disc drive (usually drive A:). Sektor is currently set to a default of 40 tracks. To change the default, change the 'LET NTRK=VAL"XX"' so that XX equals however many tracks your drive has.

To save the modifications, insert the copy (NOT the master disc) and type 'MOVE "SEKTOR.BAS",1@'. Then, to test the backup copy, type NEW, OUT 244,1 (to reenable the DOS), and finally CAT "SEKTOR.BAS",. If any error occurs, try making another backup and modifying it again, as per above. All modifications are at your own risk, and the program is very complex, so that only experienced programmers should make modifications which are NOT outlined above.